

# HW 04: Describing Distributions

Let the data be beautiful

## Purpose

There are a variety of conventional ways to visualize data - tables, histograms, bar graphs, etc. The purpose is always to examine the distribution of variables related to your research question. You will create a plot, follow up each graphic with a table of summary statistics (for quantitative variables) or frequency and proportion table (for categorical), and then a summary paragraph that brings it all together.

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## Instructions

Completely describe 2 categorical and 2 quantitative variables using all of the following:

- An explanation of what the variable is, and how it is measured.
- A table of summary statistics,
- An appropriate plot with titles and axes labels,
- A short paragraph description in full complete English sentences.

To guide your description of this distribution try to include the following information:

- What is the trend in the data? What exactly does the chart show? (Use the chart title to help you answer this question)
- Describe the location of the bulk of the data. Measures include
  - Measures of center: mean/median
  - IQR as Q3 and Q1 (i.e., 50% of the data lie between  $x_1$  and  $x_2$ )
  - N and (%) for categorical data for the largest category.
- Describe the shape (for quantitative measures only):

- Symmetry/Skewness - Is it symmetric, skewed right, or skewed left?
    - Modality - Is it uniform, unimodal, or bimodal?
  - Describe the spread or variability in the data
    - Appropriate measures include range, standard deviation, IQR for continuous data
    - For categorical data describe if distribution is spread across multiple response categories or mainly only one.
  - Describe the outliers (note: there may not be any for every graph). Continuous data only.
    - Are there any outliers for the variable?
    - If yes, are these true outliers or false (due to data management or input error) outliers? (This could alert you to missing codes like -77 or 99 that need to be set to missing)
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## Submission instructions

- Use the template provided: [\[QMD\]](#)
    - Right click and 'save as', put this in your `scripts` folder
  - Upload your draft PDF to Canvas by the due date
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## Example

This example uses the `mpg` data set from the `ggplot2` package.

```
# Load libraries
library(sjPlot); library(ggplot2);library(ggpubr)

# Import data
# load(here("data", "data.Rdata")) # your import line will look something like this
```

text written like this are example student submission text

## Basic categorical

Draft style plot, direct computer output showing/copied. Poor grammar and/or sentence structure, no attempt at explaining what the variable means, extra unnecessary or incorrect information included. Typos.

```
table(mpg$class)
```

2seater	compact	midsize	minivan	pickup	subcompact	suv
5	47	41	11	33	35	62

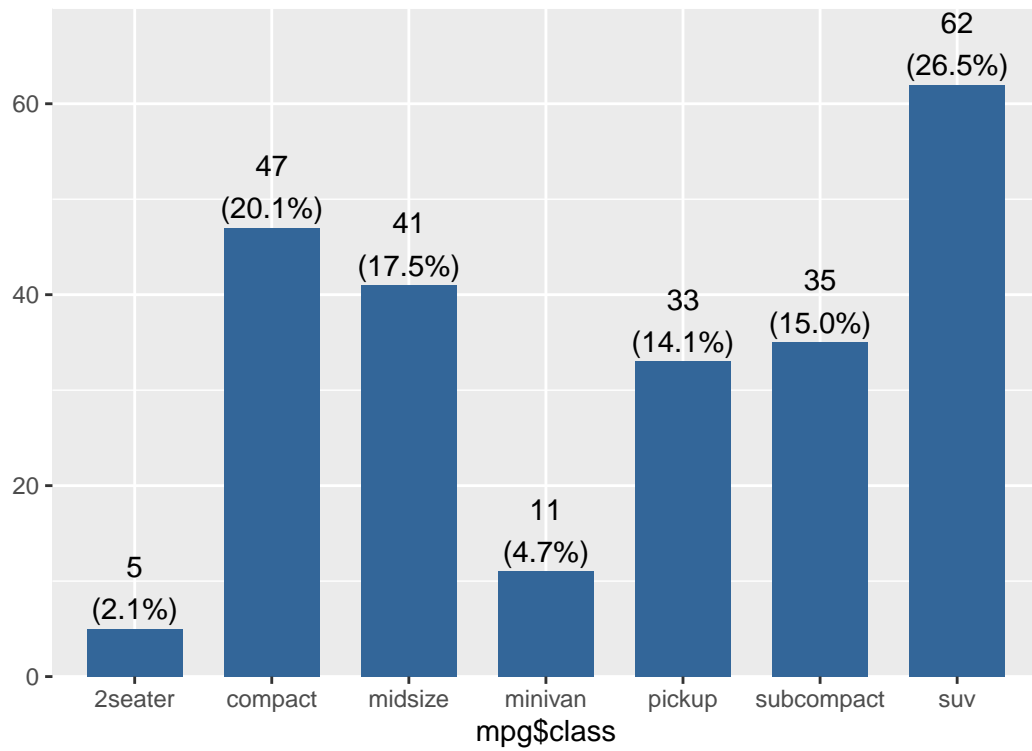
class has more suvs than compacts. 2% are 2seaters. there are 5 2seaters 47 cmpact 41 midize 11 minivans 33 pickups 35% subcompacts, 62 suv and 234 total cars.

## Proficient categorical

Cleaned up plot, full English sentences, useful text formatting of variable names and levels. Explained what the variable was named and what it measured.

The `class` variable from the `mpg` data set is a categorical variable that describes the type of vehicle being measured. Some levels of this categorical variable include *compact*, *pickup* and *suv*.

```
plot_frq(mpg$class)
```

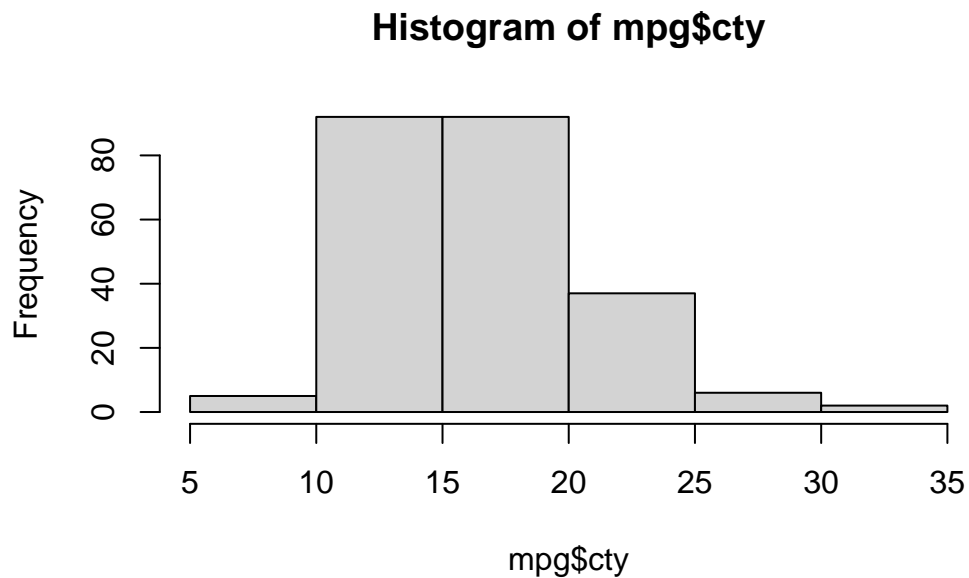


Sub compact cars are the most frequently reported type of car, making up over one-quarter (26.5%) of the cars in this data set with  $n=62$  cars represented. The least represented car is a compact car with  $n=5$  (2.1%) records.

## Basic quantitative

A “for your eyes only” quality plot, minimal description of characteristics, no information about the variable provided.

```
hist(mpg$cty)
```



```
summary(mpg$cty)
```

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
9.00	14.00	17.00	16.86	19.00	35.00

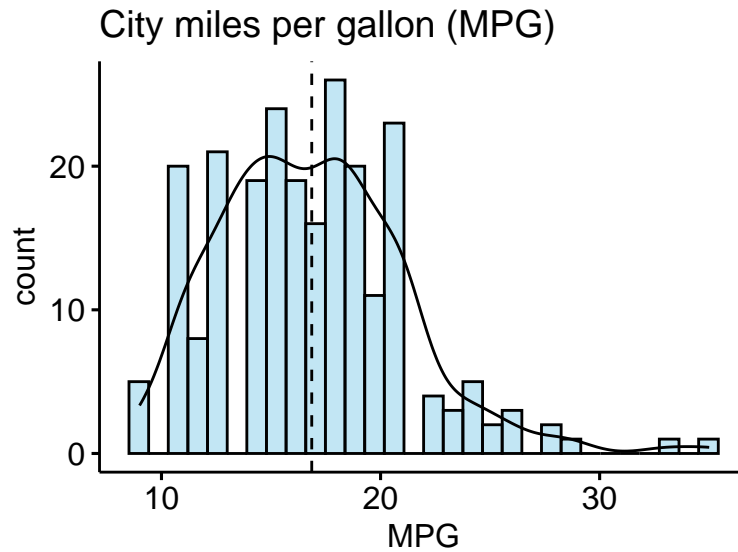
cty is normally distributed between 5 and 35 with mean 17.

## Proficient quantitative

Overlaid a density curve on the histogram, added a dashed line at the mean. Table of summary statistics present in a nicely formatted way, digits rounded appropriately. Plot cleaned up with appropriate axis and titles.

The `cty` variable records the miles per gallon (mpg) achieved during city driving. This is a quantitative numeric variable.

```
# this function is from the ggpubr package
gghistogram(data=mpg, x = "cty", add = "mean", fill = "skyblue", add_density = TRUE,
            xlab = "MPG", title = "City miles per gallon (MPG)")
```



```
summary(mpg$cty)
```

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
9.00	14.00	17.00	16.86	19.00	35.00

The MPG in the city ranges from 9 to 35, unimodal and is slightly skewed right with a mean of 16.9 close to the median of 17 and a standard deviation of 4.3mpg. The histogram indicates that there are at a few upper end potential outliers achieving a city MPG of approximately over 30 mpg.